

Internet Futures



Acknowledgement to Anders Rockstrom
of Tetia Sonera, whose presentation on
this topic had a profound impact on me –
he presented his arguments so clearly and
simply it was just an irresistible message.

Thanks Anders!

Geoff

purpose:



share some thoughts
about the Internet
and its future

think about some
of the major
factors that will
shape our future

why

The mainstream
telecommunications
industry has a
rich history



why

The mainstream
telecommunications
industry has a
rich history

...of making very poor
technology guesses



why

The mainstream
telecommunications
industry has a
rich history

...of making very poor
technology guesses

and regularly being
taken by
surprise!



why

could we do a
better job?



One approach:

1. Observe the situation and what's happening

One approach:

1. Observe the situation and what's happening
2. Understand what's going on
3. Understand where this may lead us and what options may be presented on the way

One approach:

1. Observe the situation and what's happening
2. Believe what we see *(the most difficult one!)*
3. Understand where this may lead us and what options may be presented on the way

What's Happening Today: User Preferences and the Market for Services

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From radio to tv to ?

What's Happening Today: User Preferences and the Market for Services

From radio to tv to ?

 'IPTV'

What's Happening Today: User Preferences and the Market for Services

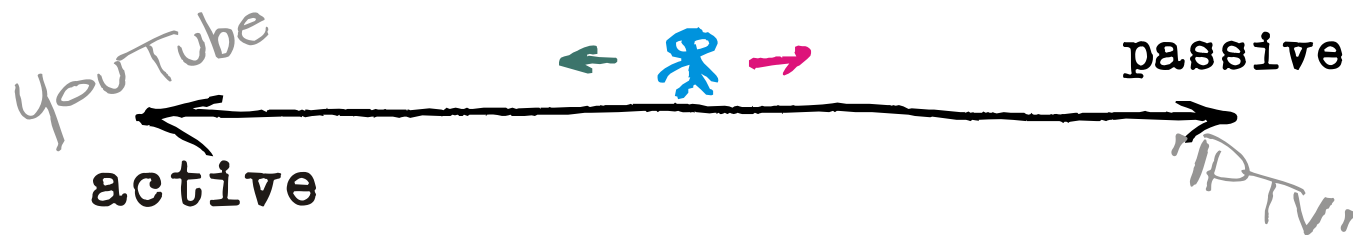
From radio to tv to ?



What's Happening Today: User Preferences and the Market for Services

From telephony to chat
to mashups to p2p to ?

From radio to tv to ?



Service Profile Choices

Open collaboration
framework

open

vs

walled
garden

Bundled services

Service Profile Choices

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Bundled services

role
specialization

open delivery
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Service / content
distribution networks

Vertical
integration

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Service / content
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Vertical
integration

Active user
networks

user
produced

vs

externally
produced

Passive users

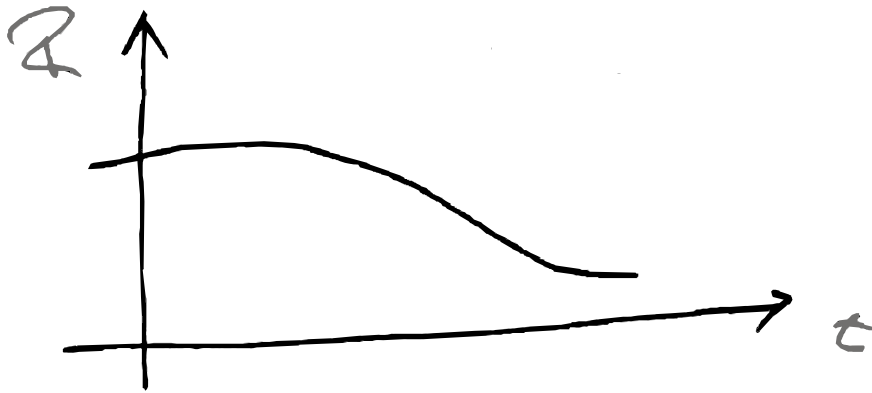
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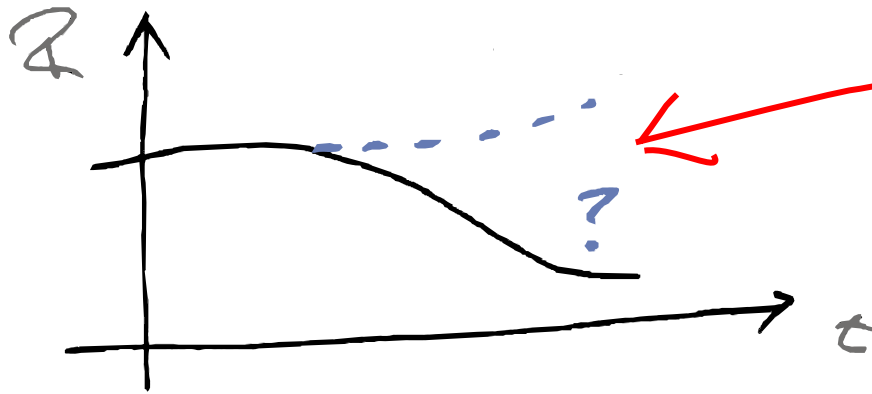
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What's Happening Today: Declining Revenue Profile for incumbent telcos



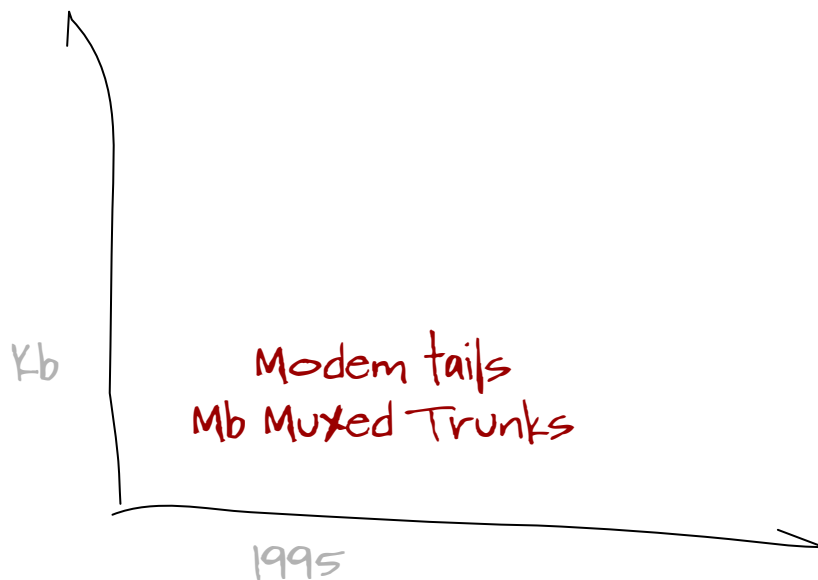
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How to fill the gap of the
Internet's revenue leak?

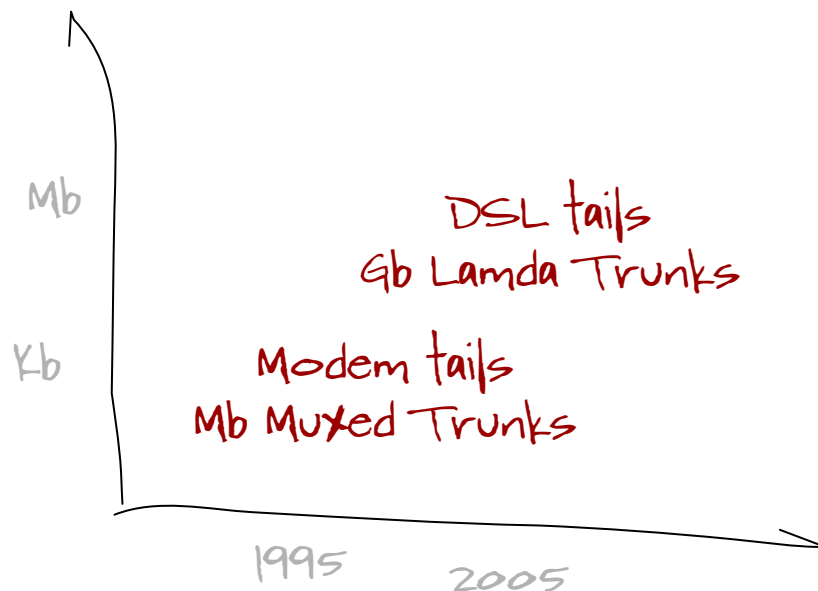
Whats Happening Today: Demand for Bandwidth

what mass market customers want for \$25 per month!



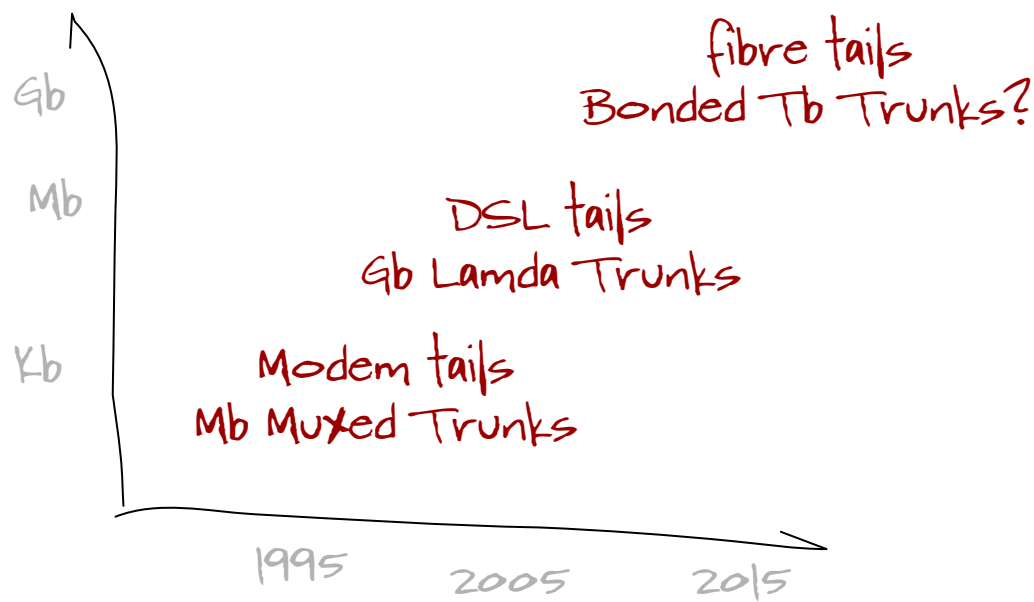
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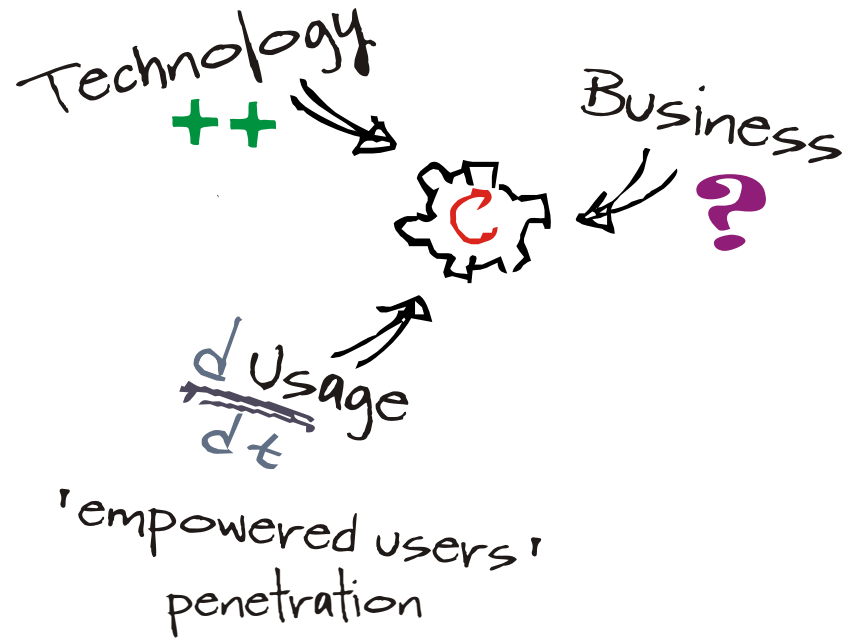
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driver dimensions



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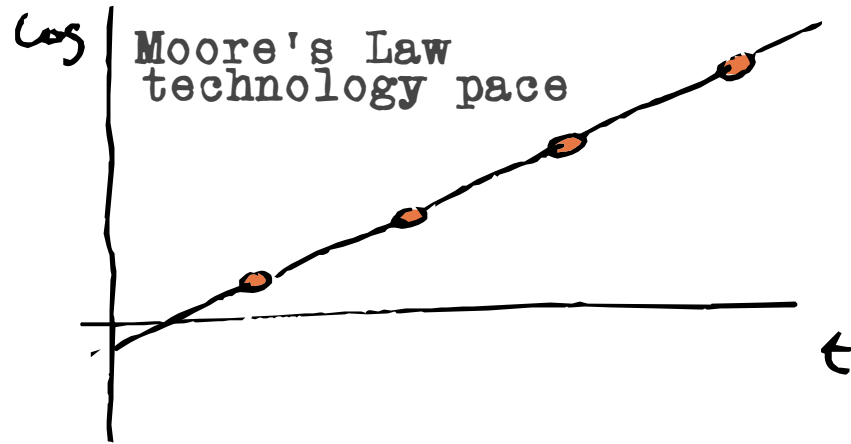
technology

++

surplus

fast refill

enabling windows



technology

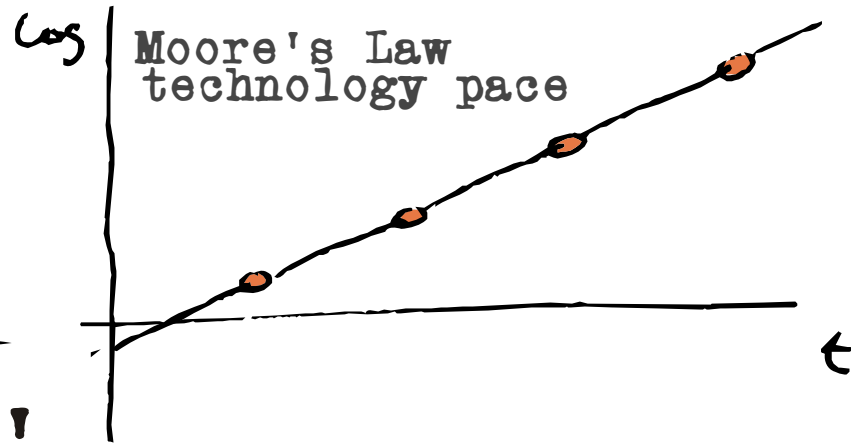
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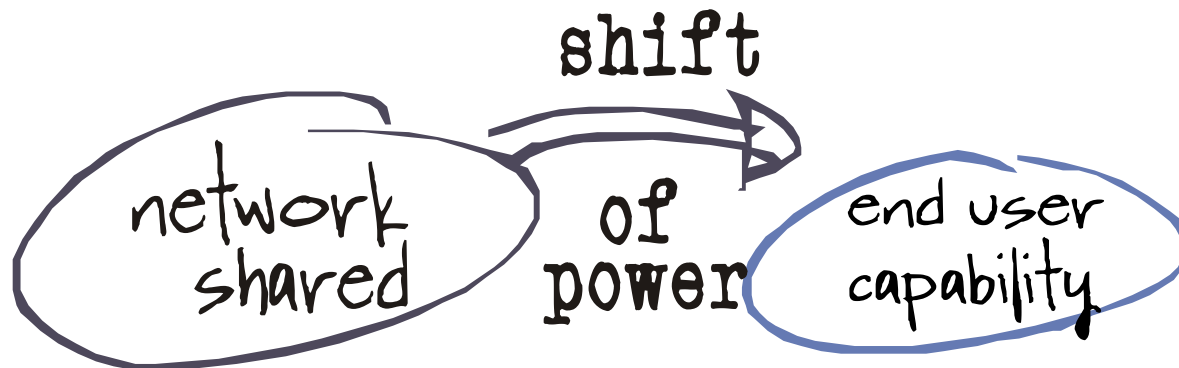
see it ...
... seize it !



technology

++

technology push and network architecture



technology

new production paradigms

"Over the top"
applications



a 'network—service'
produced outside
of the 'network'

technology

new production paradigms

"Over the top"
applications



a 'network—service'
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Content production is a commodity
application that users sustain
through sharing, rather than a
valuable service that is produced
externally through dedicated
production channels

technology

surplus enables
divergence

for
simplicity and
performance

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~~QoS~~ ~~IMS~~
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no need for
IP-convergence

Web enabled user generated
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heterogeniety

convergence complemented
with divergence

interoperability

when there is a
use for it

$\frac{d}{dt}$ usage

fuelling the usage growth fire

$\frac{d}{dt}$ usage

fuelling the usage growth fire

usage = scaling

$\frac{d}{dt}$ usage

fuelling the usage growth fire

Please send heaps more....

bandwidth
switching fibre routes storage
routing
addressing delivering
silicon density
memory speed power heat dissipation
storage efficiency

usage = scaling

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But is bigger always cheaper?

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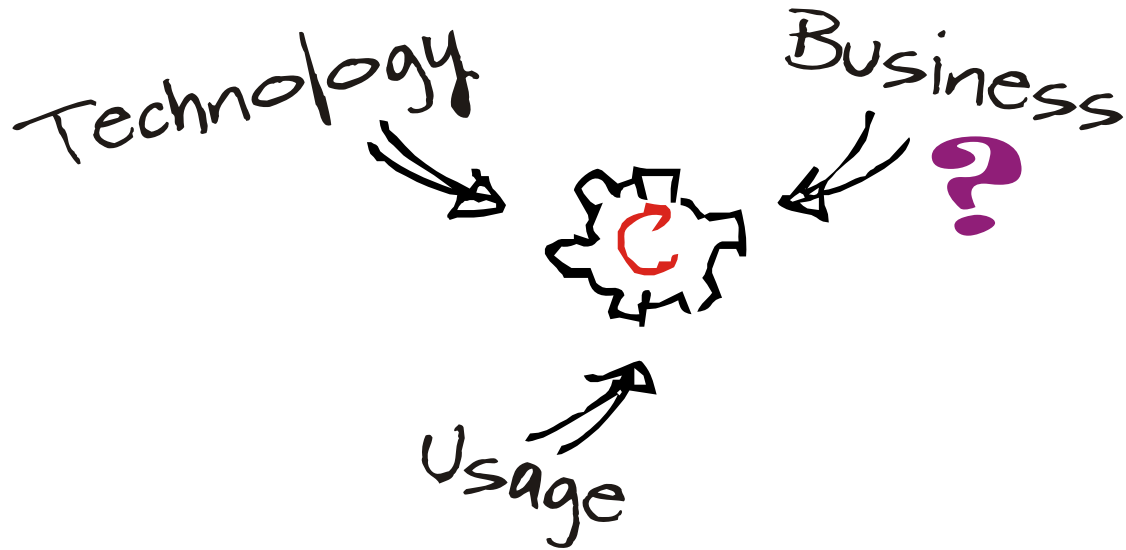
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usage = scaling

But is bigger always cheaper?
and what happens when it's not?

Business modelling



..today operators
tend to be very
hype driven ..

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hype driven ..

convergence

seemlessnet

NGN - . . .

triple play

..today operators
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✱ Everyone is talking
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..today operators
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- ✖ Everyone is talking
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- ✖ Few have actual
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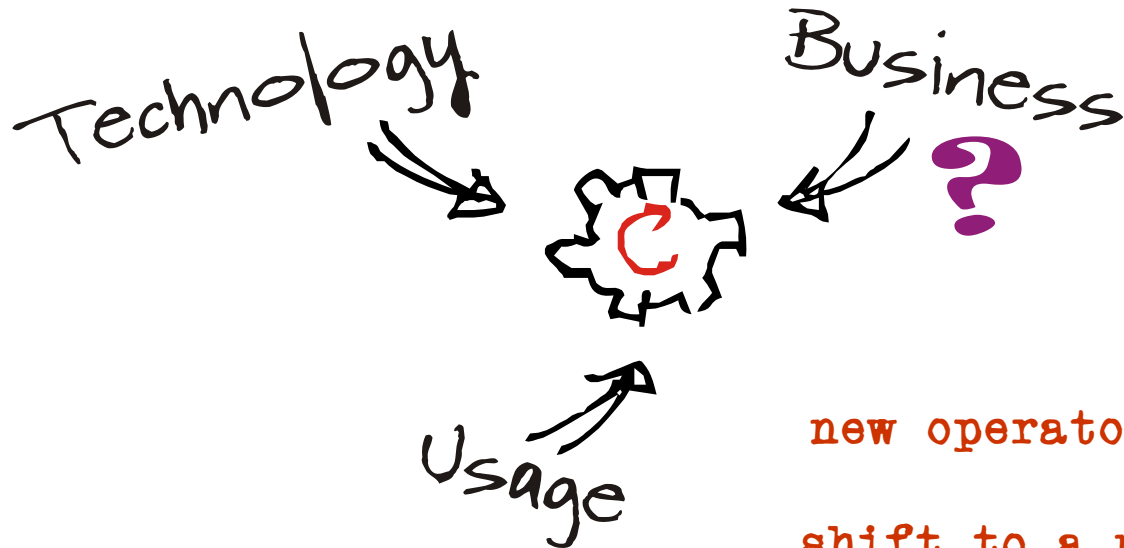
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NGN - . . .

triple play

- ✖ Everyone is talking about it
- ✖ Few have actual experience
- ✖ .. and the actual experiences are mostly failures

Business modelling



new operator roles being defined

shift to a new business structure

.. involving users
and other stake-holders

Business modelling

❑ Packet pushing is a commodity utility activity

Low margins

Low barriers to entry

No product differentiation

Deregulation and competition

Valued services are overlays to the network

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Valued services are overlays to the network

❑ Traditional revenue streams are vaporizing

Wired telephony

Business data products

Local Access
monopolies

Mobile telephony

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❑ Investors remain nervous about telcos

Cost of capital is high

Consumers are fleeing legacy telcos in the face of price gouging

Shareholder returns need to stay high

No residual expertise left in-house

So where are
we heading?

My personal view sees the following..

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network

commodity utility
network operation

high capacity
packet pushing

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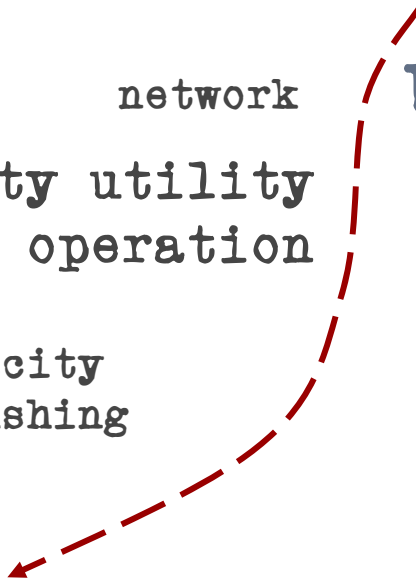
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user - drive, production
p2p, content, ..

User-centric applications,
not network-centric services

Value shift up
the protocol stack



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Reinvention:

involving users
new partners

and different business models

Drilling down...

So far this is all rather abstract

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Lets take a more detailed look at
some specific technologies

Drilling down...

This is all rather abstract

And bear in mind that the shape of the future can often be found in the mistakes of the past!

Lets take a more detailed look at some specific technologies

IP was just so simple...

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Hop-by-hop stateless forwarding

Datagram transmission

End-To-End data integrity

Decoupled resource management, topology management

What could possibly go wrong?

What's not working...

What's not working...

Multicast

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MPLS

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Congestion Control

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What really needs to work...

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Scaling

Where to from here?

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What 'worked' for the Internet was the shift of control from network to edge

Where to from here?

What's giving us some grief is the overloading of location and identity

What 'worked' for the Internet was the shift of control from network to edge

And if we want to scale further we need to understand flow dynamics and feedback control systems to pack the elephants and mice into the same wavelengths or into the same spectrum frequency

Where to from here?

What's giving us some grief is the overloading of location and identity

What 'worked' for the Internet was the shift of control from network to edge

In thinking about a future Internet

There's no need to clean the slate

There's no need to clean the slate

Nor to forget everything we've learned
about packet networks so far

There's no need to clean the slate

Nor to forget everything we've learned
about packet networks so far

But we need to think about a future that is way
beyond today's Internet

And as we look at the evolution of the technology there are probably two important design principles to bear in mind ...

Focus

Simplicity

a closing thought

I'm probably going to be proved wrong as much as I may be right with these thoughts. There is no certain track of progress here.

Each shift of the Internet's use paradigm through innovation is as much a surprise to the innovator as it is to everyone else

which is probably a very good thing!